
Space Weather Technical Forecast

Issued on Friday, 18 November 2022 at 01:12 Local

This technical forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales <https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales>

Space Weather Forecast Headline: Slight chance of M-class flares (Minor to Moderate radio blackouts) throughout. Chance of G1 (Minor Storm) from late Day 2 (19 Nov) onwards.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity over the past 24 hours has been predominantly at Low levels, with often frequent but low level C-class flare activity. The largest flare was a C6 at 17/0928 UTC originating from AR3145.

There are now four numbered regions on the visible disc and one new unnumbered region. AR3147 (Hx/Alpha) in the southeast is the largest spot currently on the visible disc and currently remains uni-polar and stable. There are two other regions in the southeast quadrant which are both relatively simple. The other region, AR3149 (Bxo/Beta) continues to emerge from the northeast limb. Previously mentioned AR3145 has since passed beyond the northwest limb and appears to have faded.

No Earth-directed CMEs have been observed in available imagery.

Solar Wind / Geomagnetic Activity: The solar wind as observed at L1 by ACE/DSCOVR, has been slow-ambient between 300-390 km/s, with a gradual increase from the start of the period. Density has been predominantly below average with brief periods at average levels. The total magnetic field strength (IMF) has been weak throughout remaining below 7 nT. The north-south component, Bz, has fluctuated weakly between +6/-2 nT. Phi angle has been mostly negative (towards the Sun) but switched to positive (away from the Sun) between 17/0900-1200 UTC. Geomagnetic activity was Quiet (Kp 0-1).

Energetic Particles / Solar Radiation: The high energy proton flux (greater than 10 MeV) as measured at GOES-16 has remained at background levels. High energy electron flux (greater than 2 MeV) at GOES-16 has been at background to moderate levels, with a peak of 262 pfu at 17/1705 UTC. Electron fluence levels remained well below Active (1e8 integrated pfu) levels, with a very slight downward trend. Observed fluence at 18/0001 UTC was 5.31e6 integrated pfu.

Four-Day Space Weather Forecast Summary

Solar Activity: Solar activity is expected to remain generally Low during the period. There is a slight, although diminishing, chance of both isolated M-class and X-flares through Days 1 and 2, from ex-AR3140, ex-AR3141 and ex-AR3145 as they continue to rotate beyond the northwest limb. The slight chance of M-Class flares persists on Days 3 and 4 due to further active regions which are expected to rotate onto the visible disc.

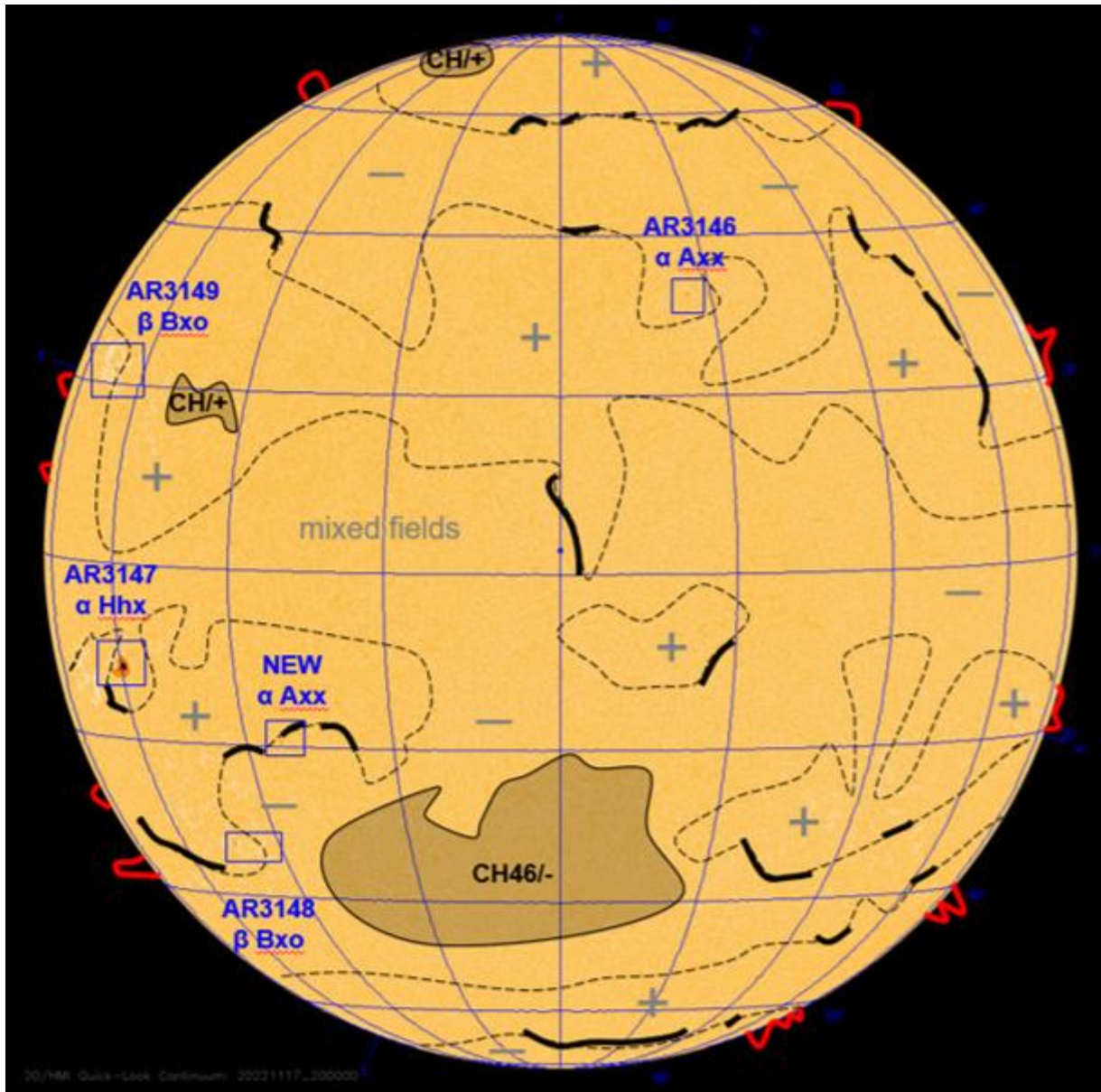
Solar Wind / Geomagnetic Activity: No significant Earth-directed CMEs are expected during the period, although some minor CME effects are possible from glancing blows on Day 1 (18 Nov) and Day 4 (21 Nov).

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Solar winds are currently at slow-ambient levels and expected to remain so through Day 1. An enhancement to Slightly Elevated or Elevated levels is likely from later on Day 2 (19 Nov), persisting into Day 4 (21 Nov) as the large negative polarity coronal hole in the southwest disc gradually becomes geoeffective. Geomagnetic activity is forecast to be predominantly Quiet through Day 1 and much of Day 2, with a chance of Unsettled periods and a slight chance of isolated Active intervals should any CME effects manifest. Later on Day 2 and throughout Days 3 and 4, Unsettled to Active levels are likely, with a chance of an isolated G1 (Minor Storm) under coronal hole HSS influence.

Energetic Particles / Solar Radiation: The high energy proton flux (greater than 10 MeV) observed by GOES-16 is most likely to remain at background levels throughout. There is initially a slight chance of a solar radiation storm from ex-AR3140 and ex-AR3141 now located beyond the northwest limb. Electron flux is forecast to remain at mostly background to moderate levels throughout the period. Fluence values are expected to remain below or well below the Active (1e8 integrated pfu) threshold throughout.

Figure 1. Solar Analysis Valid 17/2000 UTC.



Key: Filament —, Prominence —, Magnetic Field Line - - -, Polarity +/-, Coronal Holes: Grey shaded area CHxx +/-, Sunspot groups 25xx - Mt Wilson α - β - $\beta\gamma$ - $\beta\gamma\delta$ and Zurich-McIntosh Axx etc.

Geomagnetic Storms:

No significant Earth-directed CMEs are expected during the period, although some minor CME effects are possible. Filament lift-offs were observed on the 13 Nov, 14 Nov and 16 Nov. These are predicted to pass ahead of Earth's orbit, but modelling suggests that they could result in a weak glancing interaction on Day 1 (18 Nov) and Day 4 (21 Nov). However, no significant impacts are anticipated if encountered at Earth.

Solar winds are currently at slow-ambient levels and expected to remain so through Day 1 (18 Nov). An enhancement is likely from late Day 2 (19 Nov) into Day 3 (20 Nov) as the large negative polarity coronal hole in the southern disc starts to become geoeffective, with enhancement then expected to persist into Day 4 (21 Nov). Wind speeds are expected to become Slightly Elevated, with periods at Elevated levels as the connection to the coronal hole HSS occurs.

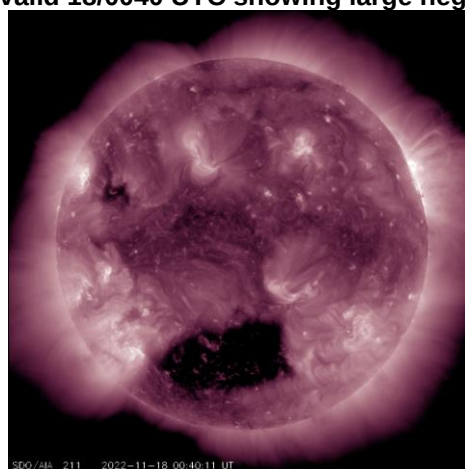
Geomagnetic activity is forecast to be predominantly Quiet through Day 1 and much of Day 2, with a chance of Unsettled periods and a slight chance of isolated Active intervals should any CME effects manifest. Later on Day 2 and throughout Days 3 and 4, Unsettled to Active levels are likely, with a chance of an isolated G1 (Minor Storm) under coronal hole HSS influence.

Geo-Magnetic Storm	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Minor or Moderate	G1 to G2	No	10	20	40	40
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Geomagnetic Activity - Earthbound Coronal Mass Ejections

Nil expected.

Figure 2: SDO/AIA 211 Imagery valid 18/0040 UTC showing large negative polarity CH46

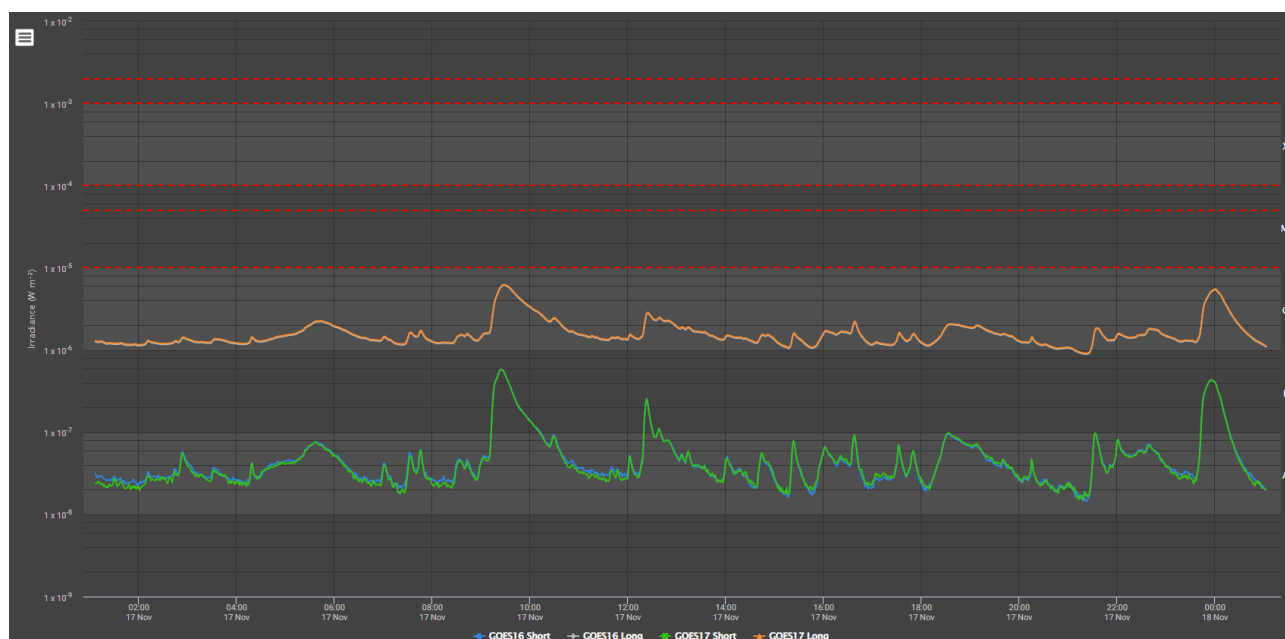


Radio Blackouts - X-Ray Flares:

Solar activity is expected to remain generally Low during the period. There is a slight chance of both isolated M-class and X-flares through Days 1 and 2, from ex-AR3140, ex-AR3141 and ex-AR3145 as they continue to rotate beyond the northwest limb and onto the far-side disc. The slight chance of isolated M-class flares persists through the period as a factor of AR3147 gradually rotating across the disc into an increasingly geoeffective position, and the possible emergence of further active regions which are currently expected to rotate onto the disc on Days 3 and 4 (20 and 21 Nov).

X Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability			(%)	(%)	(%)	(%)
Active	R1-R2 M Class	No	20	10	10	10
Very Active	R3 to R5 X Class	No	5	1	1	1

Figure 3: X-Ray flare trace showing low level C-class flares



Solar Radiation Storms - (High Energy Protons):

The high energy proton flux (greater than 10 MeV) at GEO, as observed by GOES-16, is currently at background levels and is most likely to remain at this level throughout the period. However, the diminishing presence of AR3140 and AR3141, now beyond the northwest limb, initially poses a slight risk of proton storms above background conditions.

Radiation Storms	Level (cm ⁻² sr ⁻¹ s ⁻¹)	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Active	≥ S1	No	5	2	1	1
Very Active	≥ S3 [*]	No	1	1	1	1

^{*} S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = cm⁻²sr⁻¹s⁻¹)

High Energy Electrons Event (≥ 2MeV):

Electron flux (greater than 2MeV) is currently at mostly background levels and is forecast to be at background to moderate levels throughout the period.

Electron fluence values are well below the Active (1e8 integrated pfu) threshold and are expected to remain so throughout the period. The MOSWOC REFM is considered to be giving good guidance, with electron fluence values expected to remain below the Active threshold. On the previous rotation fluence levels remained below the Active threshold, a similar trend is considered to be probable this rotation.

GEO Electron Environment	Level (cm ⁻² sr ⁻¹ day ⁻¹)	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Active	≥ 2 MeV ≥ 1x10 ⁸	No	1	1	1	1
Very Active	≥ 2 MeV ≥ 1x10 ⁹	No	1	1	1	1

Figure 4: MOSWOC REFM

